

**Amendment and Response**

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Serial No.: 10/050,639

Confirmation No.: 6476

Filed: January 15, 2002

For: METHOD AND COMPOSITION FOR SELECTIVELY ETCHING AGAINST COBALT SILICIDE**Amendments to the Claims**

This listing of claims replaces all prior versions, and listings, of claims in the above-identified application:

**Listing of Claims**

1-45. (Canceled)

46. (Previously Presented) An etching method for use in integrated circuit fabrication, the method comprising:

providing a substrate assembly comprising a metal nitride region and a cobalt silicide region; and

selectively etching a portion of the metal nitride region against the cobalt silicide region using a solution comprising a mineral acid and a peroxide, wherein the solution etches the portion of the metal nitride region at an etch rate in a range of about 50 Å/minute to about 250 Å/minute.

47-50. (Canceled)

51. (Previously Presented) The method according to claim 46, wherein the mineral acid comprises at least one mineral acid selected from a group consisting of HCl, H<sub>2</sub>SO<sub>4</sub>, H<sub>3</sub>PO<sub>4</sub>, HNO<sub>3</sub>, and dilute HF.

52. (Original) The method according to claim 51, wherein the mineral acid comprises HCl.

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53. **(Previously Presented)** The method according to claim 46, wherein the solution comprises a ratio in a range of about 1:1:35 (mineral acid:peroxide:deionized water) to about 1:1:5 (mineral acid:peroxide:deionized water).
54. **(Original)** The method according to claim 53, wherein the solution comprises a ratio in a range of about 1:1:25 (mineral acid:peroxide:deionized water) to about 1:1:10 (mineral acid:peroxide:deionized water).
55. **(Previously Presented)** The method according to claim 46, wherein the solution comprises a ratio in a range of about 0.05:1:6 (mineral acid:peroxide:deionized water) to about 1:1:6 (mineral acid:peroxide:deionized water).
56. **(Original)** The method according to claim 55, wherein the solution comprises a ratio in a range of about 0.1:1:6 (mineral acid: peroxide:deionized water) to about 0.5:1:6 (mineral acid:peroxide:deionized water).
57. **(Original)** The method according to claim 46, wherein the peroxide comprises hydrogen peroxide.
58. **(Original)** The method according to claim 46, wherein the solution comprises a ratio in a range of about 1:50 (peroxide:deionized water) to about 1:1 (peroxide:deionized water).
59. **(Original)** The method according to claim 58, wherein the solution comprises a ratio in a range of about 1:10 (peroxide:deionized water) to about 1:5 (peroxide:deionized water).
60. **(Currently Amended)** An etching method for use in integrated circuit fabrication, the method comprising:  
providing a substrate assembly comprising a metal nitride region and a cobalt region; and

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selectively etching the cobalt region against the metal nitride region using a solution comprising a mineral acid and a peroxide, wherein selectively etching the cobalt region comprises using the metal nitride region as an etch stop.

61. (Original) The method according to claim 60, wherein the mineral acid comprises at least one mineral acid selected from a group consisting of HCl, H<sub>2</sub>SO<sub>4</sub>, H<sub>3</sub>PO<sub>4</sub>, HNO<sub>3</sub>, and dilute HF.
62. (Original) The method according to claim 61, wherein the mineral acid comprises HCl.
63. (Original) The method according to claim 60, wherein the peroxide comprises hydrogen peroxide.
64. (Original) The method according to claim 60, wherein the solution comprises a ratio in a range of about 1:1:300 (mineral acid:peroxide:deionized water) to about 1:1:70 (mineral acid:peroxide:deionized water).
65. (Original) The method according to claim 64, wherein the solution comprises a ratio in a range of about 1:1:200 (mineral acid:peroxide:deionized water) to about 1:1:100 (mineral acid:peroxide:deionized water).
66. (Original) The method according to claim 60, wherein selectively etching the cobalt region against the metal nitride region further comprises selectively etching the cobalt region against the metal nitride region at an etch rate in a range of about 50 Å/minute to about 500 Å/minute.
67. (Original) The method according to claim 60, wherein selectively etching the cobalt region against the metal nitride region further comprises selectively etching the cobalt region

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against the metal nitride region at an etch rate in a range of about 100 Å/minute to about 200 Å/minute.

68. **(Original)** An etching method for use in integrated circuit fabrication, the method comprising:
- providing a substrate assembly comprising a metal nitride region;
  - forming a cobalt region on a first portion of the metal nitride region;
  - forming a cobalt silicide region on a second portion of the metal nitride region; and
  - selectively etching the cobalt region against the cobalt silicide region stopping on the first portion of the metal nitride region using a solution comprising a mineral acid and a peroxide.
69. **(Original)** The method according to claim 68, wherein the mineral acid comprises at least one mineral acid selected from a group consisting of HCl, H<sub>2</sub>SO<sub>4</sub>, H<sub>3</sub>PO<sub>4</sub>, HNO<sub>3</sub>, and dilute HF.
70. **(Original)** The method according to claim 69, wherein the mineral acid comprises HCl.
71. **(Original)** The method according to claim 68, wherein the peroxide comprises hydrogen peroxide.
72. **(Original)** The method according to claim 68, wherein the solution comprises a ratio in a range of about 1:1:300 (mineral acid:peroxide:deionized water) to about 1:1:70 (mineral acid:peroxide:deionized water).
73. **(Original)** The method according to claim 72, wherein the solution comprises a ratio in a range of about 1:1:200 (mineral acid:peroxide:deionized water) to about 1:1:100 (mineral acid:peroxide:deionized water).

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74. (Original) The method according to claim 68, wherein selectively etching the cobalt region against the cobalt silicide region further comprises selectively etching the cobalt region against the cobalt silicide region at an etch rate in a range of about 50 Å/minute to about 500 Å/minute.

75. (Original) The method according to claim 68, wherein selectively etching the cobalt region against the cobalt silicide region further comprises selectively etching the cobalt region against the cobalt silicide region at an etch rate in a range of about 100 Å/minute to about 200 Å/minute.

76. (Previously Presented) An etching method for use in integrated circuit fabrication, the method comprising:

providing a substrate assembly comprising a metal nitride region and a cobalt silicide region, wherein providing the substrate assembly comprises:

forming a metal nitride layer; and

forming the cobalt silicide region on at least a first portion of the metal nitride layer; and

selectively etching a portion of the metal nitride region against the cobalt silicide region using a solution comprising a peroxide, wherein the solution etches the portion of the metal nitride region at an etch rate in a range of about 50 Å/minute to about 250 Å/minute.

77. (Previously Presented) The method according to claim 76, wherein forming the cobalt silicide region on at least the first portion of the metal nitride layer further comprises:

contacting a cobalt layer with a patterned silicon layer; and

siliciding the cobalt layer using the patterned silicon layer.

78. (Previously Presented) The method according to claim 77, wherein contacting the cobalt layer with the patterned silicon layer further comprises:

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forming the cobalt layer on the metal nitride layer;

forming a silicon layer on the cobalt layer; and

patterning the silicon layer.

79. **(Previously Presented)** The method according to claim 76, wherein the solution further comprises a mineral acid.

80. **(Previously Presented)** The method according to claim 79, wherein the mineral acid comprises at least one mineral acid selected from a group consisting of HCl, H<sub>2</sub>SO<sub>4</sub>, H<sub>3</sub>PO<sub>4</sub>, HNO<sub>3</sub>, and dilute HF.

81. **(Previously Presented)** The method according to claim 80, wherein the mineral acid comprises HCl.

82. **(Previously Presented)** The method according to claim 79, wherein the solution comprises a ratio in a range of about 1:1:35 (mineral acid:peroxide:deionized water) to about 1:1:5 (mineral acid:peroxide:deionized water).

83. **(Previously Presented)** The method according to claim 82, wherein the solution comprises a ratio in a range of about 1:1:25 (mineral acid:peroxide:deionized water) to about 1:1:10 (mineral acid:peroxide:deionized water).

84. **(Previously Presented)** The method according to claim 79, wherein the solution comprises a ratio in a range of about 0.05:1:6 (mineral acid:peroxide:deionized water) to about 1:1:6 (mineral acid:peroxide:deionized water).

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85. **(Previously Presented)** The method according to claim 84, wherein the solution comprises a ratio in a range of about 0.1:1:6 (mineral acid: peroxide:deionized water) to about 0.5:1:6 (mineral acid:peroxide:deionized water).
86. **(Previously Presented)** The method according to claim 76, wherein the peroxide comprises hydrogen peroxide.
87. **(Previously Presented)** The method according to claim 76, wherein the solution comprises a ratio in a range of about 1:50 (peroxide:deionized water) to about 1:1 (peroxide:deionized water).
88. **(Previously Presented)** The method according to claim 87, wherein the solution comprises a ratio in a range of about 1:10 (peroxide:deionized water) to about 1:5 (peroxide:deionized water).